

What is claimed is:

- 1 1. A method of cleaning a semiconductor device comprising the
2 steps of :
 - 3 (i) mixing HF and ozone water in a vessel to form a solution of HF
4 and ozone water; and
 - 5 (ii) dipping a semiconductor device in the vessel containing the
6 solution of HF and ozone water,
7 wherein the solution comprises about 0.034 to about 0.077 wt%
8 HF.
- 1 2. The method of claim 1, wherein the solution of HF and ozone
2 water comprises about 0.035 to about 0.075 wt% HF.
- 1 3. The method of claim 1, wherein the ozone water comprises
2 about 5 to about 150 ppm ozone.
- 1 4. The method of claim 3, wherein the ozone water comprises
2 about 15 to about 30 ppm ozone.
- 1 5. The method of claim 1, wherein in step (ii) the semiconductor
2 device is dipped for a period between about 1 and about 30 minutes.
- 1 6. The method of claim 5, wherein the semiconductor device is
2 dipped for a period of about 15 minutes.
- 1 7. The method of claim 1, whereby damaged layers and polymer
2 residue are removed from the semiconductor device.

1 8. A method of cleaning a semiconductor device comprising the
2 steps of :

3 (i) mixing HF and ozone water in a vessel to form a solution of HF
4 and ozone water;

5 (ii) dipping a semiconductor device in the vessel containing the
6 solution of HF and ozone water, and thereafter

7 (iii) introducing ozone water into the vessel to replace the solution of
8 HF and ozone water in the vessel,

9 wherein the solution comprises about 0.034 to about 0.077 wt%
10 HF.

1 9. The method of claim 8, wherein the solution of HF and ozone
2 water comprises about 0.035 to about 0.075 wt% HF.

1 10. The method of claim 8, wherein the ozone water comprises
2 about 5 to about 150 ppm ozone.

1 11. The method of claim 10, wherein the ozone water comprises
2 about 15 to about 30 ppm ozone.

1 12. The method of claim 8, wherein in step (ii) the semiconductor
2 device is dipped for a period between about 1 and about 30 minutes.

1 13. The method of claim 12, wherein the semiconductor device is
2 dipped for a period of about 15 minutes.

1 14. The method of claim 8, wherein in step (iii) ozone water is
2 flowed into the vessel thereby causing an overflow of the solution of HF and
3 ozone water out of the vessel.

1 15. The method of claim 14, wherein the ozone water is flowed into
2 the vessel thereby causing the overflow of the solution of HF and ozone
3 water out of the vessel for a period between about 1 and about 30 minutes.

1 16. The method of claim 15, wherein the period is about 20 minutes.

1 17. The method of claim 8, whereby damaged layers and polymer
2 residue are removed from the semiconductor device.

1 18. A method of cleaning a semiconductor device comprising the
2 steps of :

3 (i) introducing HF and ozone water into a vessel to form a solution
4 of HF and ozone water;

5 (ii) mixing the HF and ozone water in the vessel to form a uniform
6 solution of HF and ozone water; and

7 (iii) dipping a semiconductor device in the vessel containing the
8 uniform solution of HF and ozone water.

1 19. The method of claim 18, wherein the solution comprises about
2 0.034 to about 0.077 wt% HF.

1 20. The method of claim 19, wherein the solution of HF and ozone
2 water comprises about 0.035 to about 0.075 wt% HF.

1 21. The method of claim 18, wherein the ozone water comprises
2 about 5 to about 150 ppm ozone.

1 22. The method of claim 21, wherein the ozone water comprises
2 about 15 to about 30 ppm ozone.

1 23. The method of claim 18, wherein in step (iii) the semiconductor
2 device is dipped for a period between about 1 and about 30 minutes.

1 24. The method of claim 23, wherein the semiconductor device is
2 dipped for a period of about 15 minutes.

1 25. The method of claim 18, wherein in step (ii) the HF and ozone
2 water are mixed to form a uniform solution by circulation.

1 26. The method of claim 25, wherein the HF and ozone water are
2 circulated by a pump.

1 27. The method of claim 26, wherein the HF and ozone water are
2 circulated by flowing the HF and ozone water from an inner bath to an outer
3 bath and pumped back into the inner bath.

1 28. The method of claim 18, whereby damaged layers and polymer
2 residue are removed from the semiconductor device.

1 29. A method of cleaning a semiconductor device comprising the
2 steps of:

3 (i) introducing HF and ozone water into a vessel to form a solution
4 of HF and ozone water;

5 (ii) mixing the HF and ozone water in the vessel to form a uniform
6 solution of HF and ozone water;

7 (iii) dipping a semiconductor device in the vessel containing the
8 uniform solution of HF and ozone water; and

9 (iv) introducing ozone water into the vessel to replace the solution of
10 HF and ozone water in the vessel.

1 30. The method of claim 29, wherein the solution comprises about
2 0.034 to about 0.077 wt% HF.

1 31. The method of claim 30, wherein the solution of HF and ozone
2 water comprises about 0.035 to about 0.075 wt% HF.

1 32. The method of claim 29, wherein the ozone water comprises
2 about 5 to about 150 ppm ozone.

1 33. The method of claim 32, wherein the ozone water comprises
2 about 15 to about 30 ppm ozone.

1 34 The method of claim 29, wherein in step (iii) the semiconductor
2 device is dipped for a period between about 1 and about 30 minutes.

1 35. The method of claim 34, wherein the semiconductor device is
2 dipped for a period of about 15 minutes.

1 36. The method of claim 29, wherein in step (iv) ozone water is
2 flowed into the vessel thereby causing an overflow of the solution of HF and
3 ozone water out of the vessel.

1 37. The method of claim 36, wherein the ozone water is flowed into
2 the vessel thereby causing the overflow of the solution of HF and ozone
3 water out of the vessel for a period between about 1 and about 30 minutes.

1 38. The method of claim 37, wherein the period is about 20 minutes.

1 39. The method of claim 29, wherein in step (ii) the HF and ozone
2 water are mixed to form a uniform solution by circulation.

1 40. The method of claim 39, wherein the HF and ozone water are
2 circulated by a pump.

1 41. The method of claim 40, wherein the HF and ozone water are
2 circulated by flowing the HF and ozone water from an inner bath to an outer
3 bath and pumped back into the inner bath.

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